OPERATING SUMMARY

SAULT STE. MARIE

water pollution control plant

1967

ONTARIO WATER RESOURCES COMMISSION

Division of Plant Operations

ONTARIO WATER RESOURCES COMMISSION
801 BAY STREET, TORONTO 5
OFFICE OF THE GENERAL MANAGER

Members of the Sault Ste. Marie Local Advisory Committee,
City of Sault Ste. Marie.

Gentlemen:

We are happy to present you with the 1967 Operating Summary for the Sault Ste. Marie Water Pollution Control Plant, OWRC Project No. 2-0020-58.

Your co-operation with our staff throughout the year has been appreciated. Only with such co-operation can the war against water pollution be waged effectively.

Yours very truly,

D. S. Caverly,
General Manager.

B1

ONTARIO WATER RESOURCES COMMISSION
801 BAY STREET
TORONTO 5

J. A. VANCE, LL.D.
CHAIRMAN

J. H. H. ROOT, M.P.P.
VICE-CHAIRMAN

D. S. CAVERLY
GENERAL MANAGER

W. S. MacDONNELL
COMMISSION SECRETARY

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am pleased to submit to you the 1967 Operating Summary for the Sault Ste. Marie Water Pollution Control Plant, OWRC Project No. 2-0020-58.

The summary reviews progress during the year, outlines operating problems encountered and summarizes in graphs, charts and tables all significant flow and cost data.

Yours very truly,

D. A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

● This operating summary has been prepared in order to acquaint readers with the management of the project during 1967. The efficiency of the plant's operation is reflected in a general review. Significant financial details are recorded, and technical performance is illustrated by graphs and charts.

The summary should answer two salient questions. Are the project's facilities adequate at this time? And can the project meet future requirements?

The Regional Operations Engineer is primarily responsible for the preparation of the report, and will be pleased to answer any questions regarding it.

Most of the material for the graphs and charts was compiled by the statistics section of the Division of Plant Operations, with the final versions of the graphs being drawn by the draughting section of the Division of Sanitary Engineering. Cost data were provided by the Division of Finance.

It will be evident from the report that all of these groups co-operated with substantial success.

CONTENTS

SAULT STE. MARIE
water pollution control plant

operated for

THE CITY OF SAULT STE. MARIE

by the

ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN: Dr. James A. Vance

VICE-CHAIRMAN: J. H. H. Root, M. P. P.

COMMISSIONERS

W. D. Conklin, Q. C. H. E. Brown
D. A. Moodie L. E. Venchiarutti

GENERAL MANAGER: D. S. Caverly

ASSISTANT GENERAL MANAGERS

L. E. Owers K. H. Sharpe
F. A. Voege A. K. Watt

COMMISSION SECRETARY

W. S. MacDonnell

DIVISION OF PLANT OPERATIONS

DIRECTOR: D. A. McTavish

Assistant Director: C. W. Perry
Regional Supervisor: A. C. Beattie
Operations Engineer: A. Clark

801 Bay Street Toronto 5

'67 REVIEW

The average daily flow for the year was 7.66 mg or 95.8 percent of the plant hydraulic capacity. The total plant flow in 1967 was 117.66 mg more than in 1966. This was due in part to the high spring and fall flows. The flow exceeded the plant hydraulic capacity 40 percent of the time. However, the average strength of the raw sewage was well below normal.

During the first ten months of 1967, lime and ferric chloride were used as conditioning agents for the vacuum filtration of raw sludge. The cost of operating the vacuum filter for this period was $5.83 per dry ton. This represents an 11 percent decrease in costs from 1966. During the last 2 months of 1967, the use of polyelectrolytes was initiated. The cost of filtering was reduced to $3.68 per dry ton.

As in 1966 considerable man hours were spent at the Pim Street and Clark Creek sewage pumping stations. During the spring run-off, stand-by portable pumps were provided in case of equipment malfunction. Expansion of the Clark Creek facilities commenced late in 1967.

Grease from an industrial source caused frequent blockages of sludge lines at the treatment plant. The clearing of these lines continued to be a time consuming and costly nuisance.

The plant is attended 16 hours per day, seven days per week by a superintendent and a staff of nine men.

There were routine inspections by the operations engineer and his assistant, the Maintenance Section, the Special Services Section and the Safety Officer.

PROJECT COSTS

NET CAPITAL COST (Estimated)		$3,244,149.35
DEDUCT - Payments from Municipalities	$ 2,900.00	
- Portion Financed by CMHC (Estimated)	2,145,572.61	2,148,472.61
Long Term Debt to OWRC		$1,095,676.74
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1967		$ 157,723.05
Debt Retirement		$ 22,111.00
Reserve		18,909.04
Interest Charged		61,788.96
Net Operating		135,741.58
TOTAL		$ 238,550.58

RESERVE ACCOUNT

Balance at January 1, 1967	$ 107,041.68
Deposited by Municipality	18,909.04
Interest Earned	6,358.41
	$ 132,309.13
Less Expenditures	(13,396.58)
Balance at December 31, 1967	$ 118,912.55

MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	* SUNDRY	WATER
JAN	8358.76	4625.80		369.27	2409.23	647.93	36.46	104.95	5.10	98.02	62.00
FEB	7484.34	4561.15		311.41	766.98		222.73		479.07	1050.65	92.35
MARCH	15436.94	7981.95		539.09	2112.03	129.15	390.32	26.25	2952.76	1190.54	114.85
APRIL	8618.27	4977.89		118.30	841.85	773.91	255.93	68.10	211.21	1281.20	89.88
MAY	10114.70	5283.79		372.50	1100.93	1675.80	81.57		242.38	1275.71	82.02
JUNE	22136.69	5370.68		163.90	1885.70	722.93	1124.23	1297.75	279.31	11140.95	151.24
JULY	9233.67	4916.77	406.36		942.98	129.15	536.21		673.50	1390.23	238.47
AUG	10184.29	4925.95	308.64		1461.40	1897.62	159.66		195.13	926.70	309.19
SEPT	11155.74	7319.24	197.64	163.16		722.93	226.40		1134.28	1163.11	228.98
OCT	12021.44	4889.49			2376.26	2417.84	327.27	36.44	254.57	1173.65	545.92
NOV	10468.01	5027.39		163.90	951.07	853.85	137.90	60.00	287.33	2672.70	313.87
DEC	10528.73	4511.93	205.06	402.30	1765.89	526.84	196.26	250.82	104.58	2127.63	437.42
TOTAL	135741.58	64392.03	1117.70	2603.83	16614.32	10497.95	3694.94	1844.31	6819.22	25491.09	2666.19

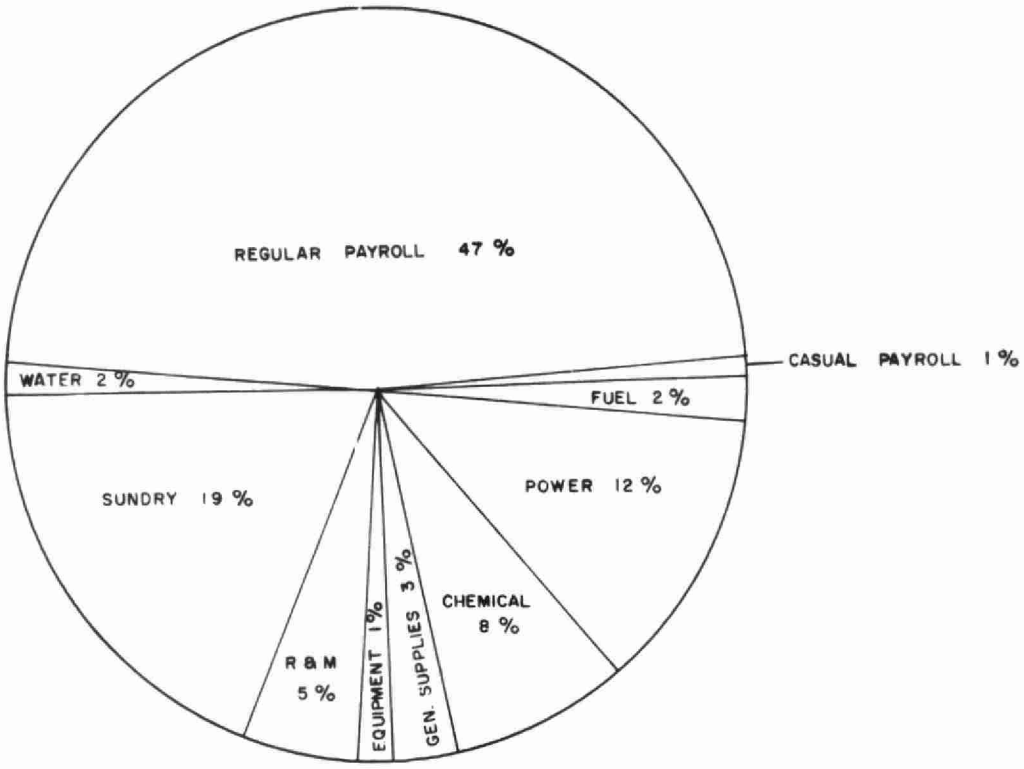
* SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE $10,473.60

YEARLY OPERATING COSTS

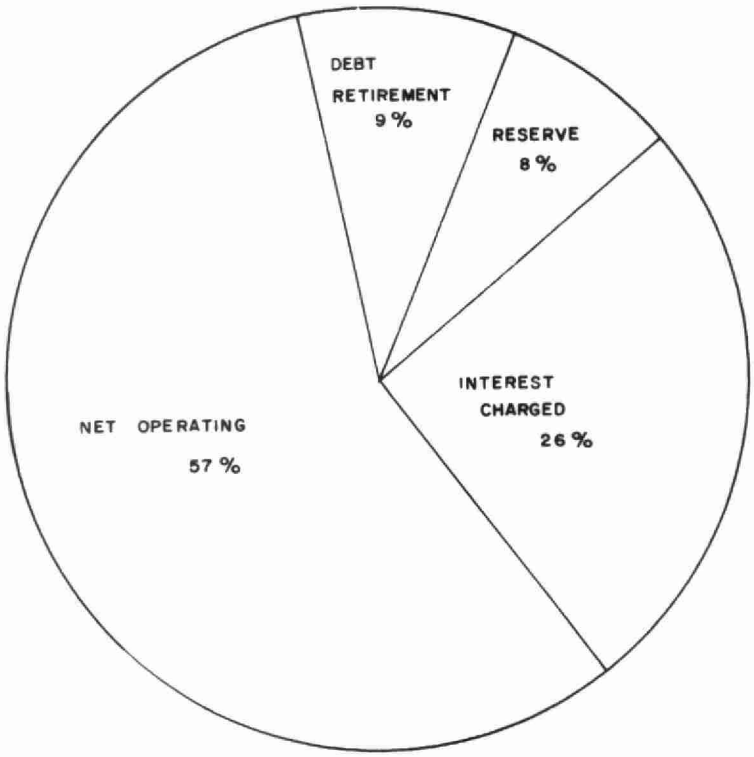
YEAR	M.G. TREATED	TOTAL COST	COST PER MILLION GALLONS	COST PER LB OF BOD REMOVED
1962	** 1601.26	$96491.83	$ 57.30	11 CENTS
1963	1764.94	$107538.08	$ 61.00	10 CENTS
1964	2432.62	$112623.50	$ 46.29	12 CENTS
1965	2831.10	$122349.41	$ 43.22	7 CENTS
1966	2668.91	$126102.15	$ 47.25	11 CENTS
1967	2796.57	$135741.58	$ 48.54	17 CENTS

** PLANT STARTED IN FEBRUARY, 1962

1967 OPERATING COSTS



TOTAL ANNUAL

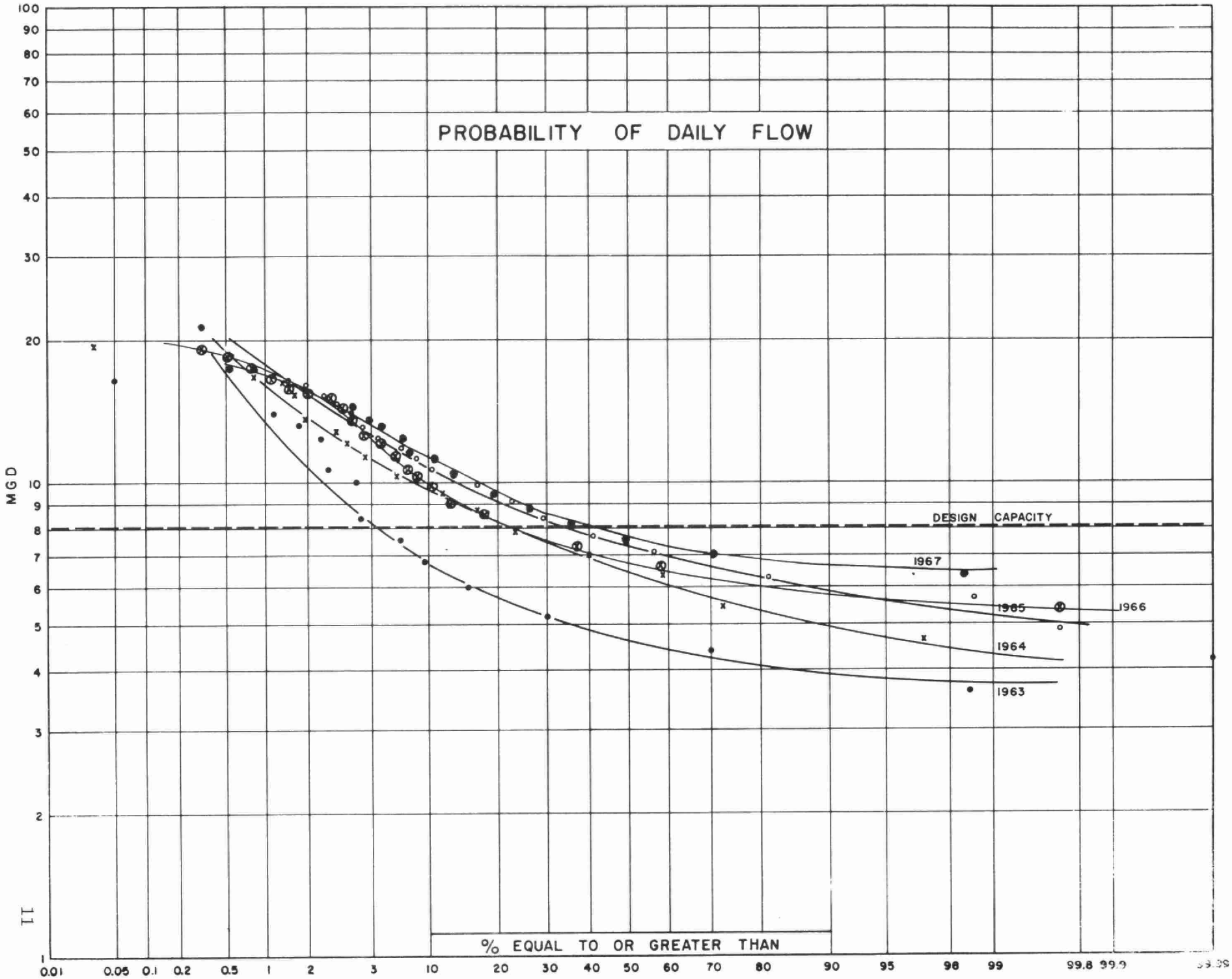


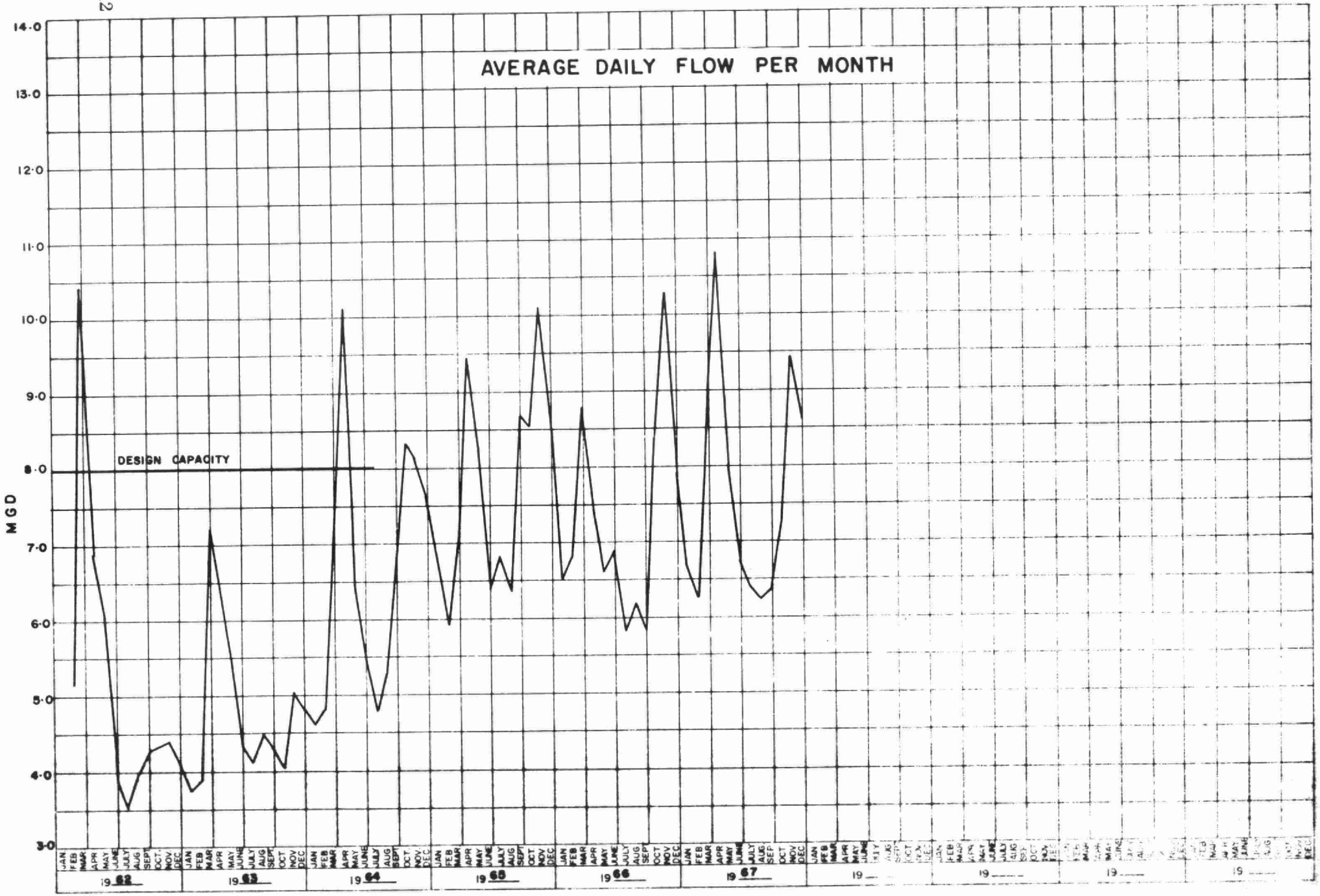
Process Data

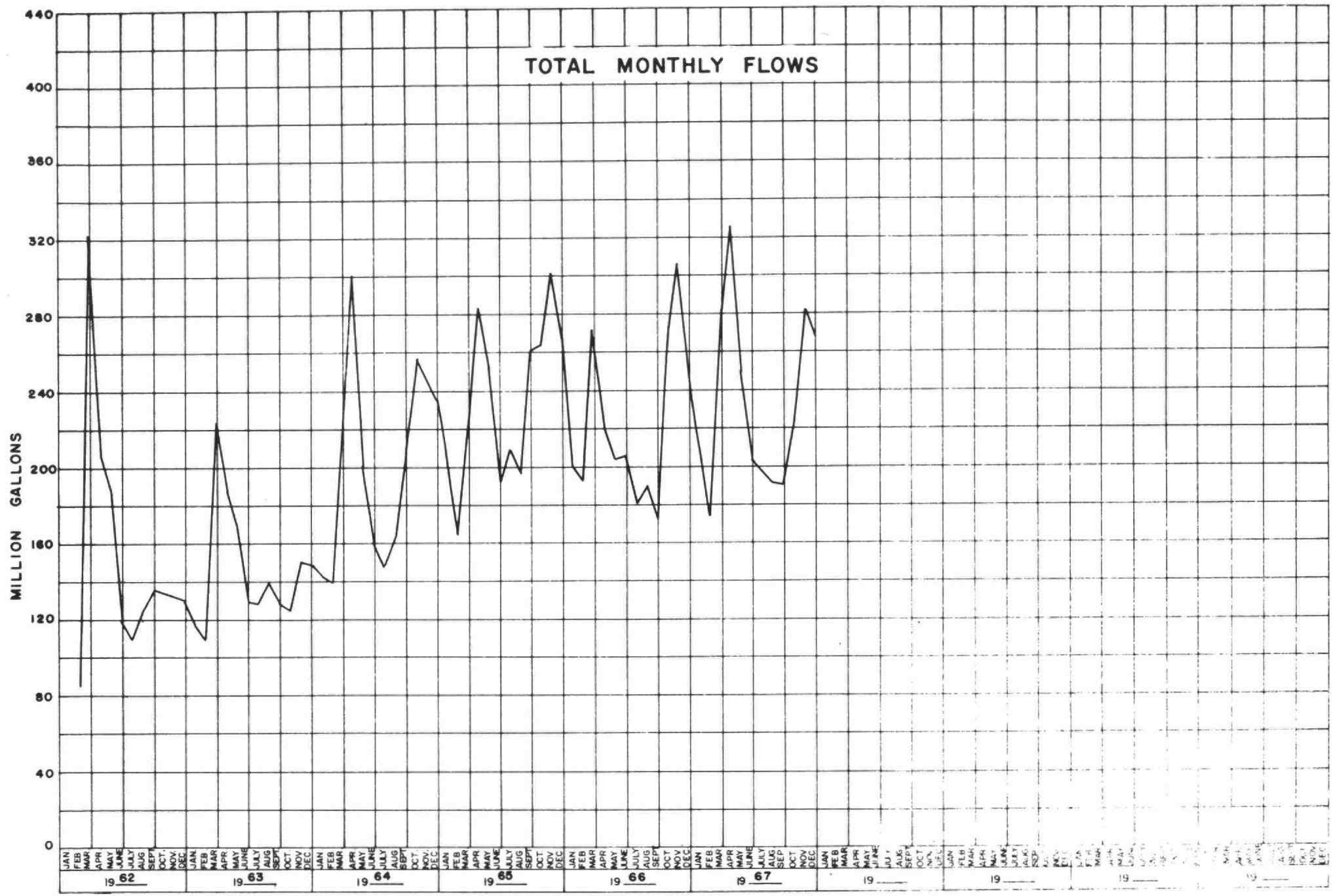
There was a slight increase in flow in 1967. The plant was hydraulically overloaded 40% of the time compared with 25% of the time in 1966.

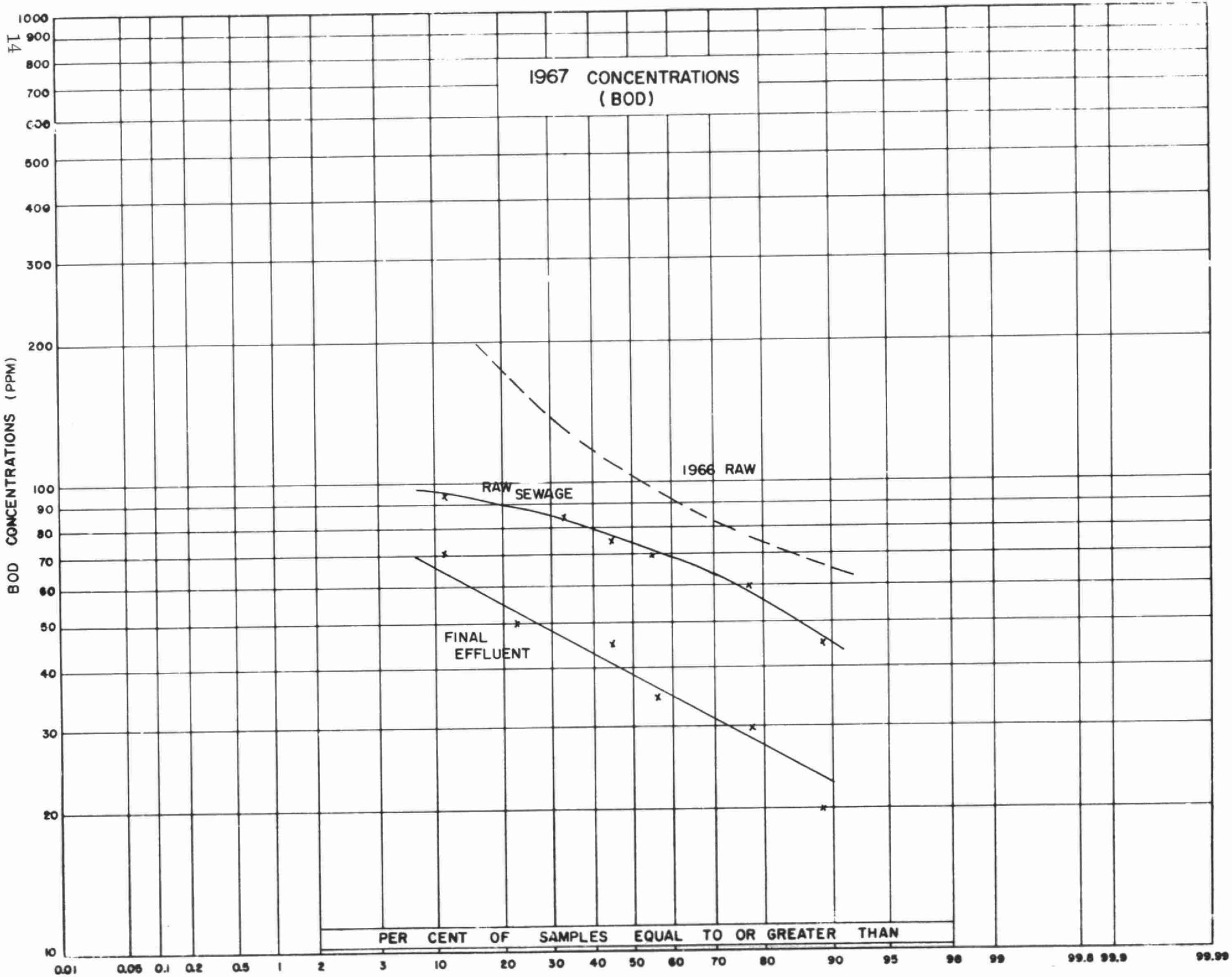
This can be explained in part by the high spring and fall flows experienced in 1967.

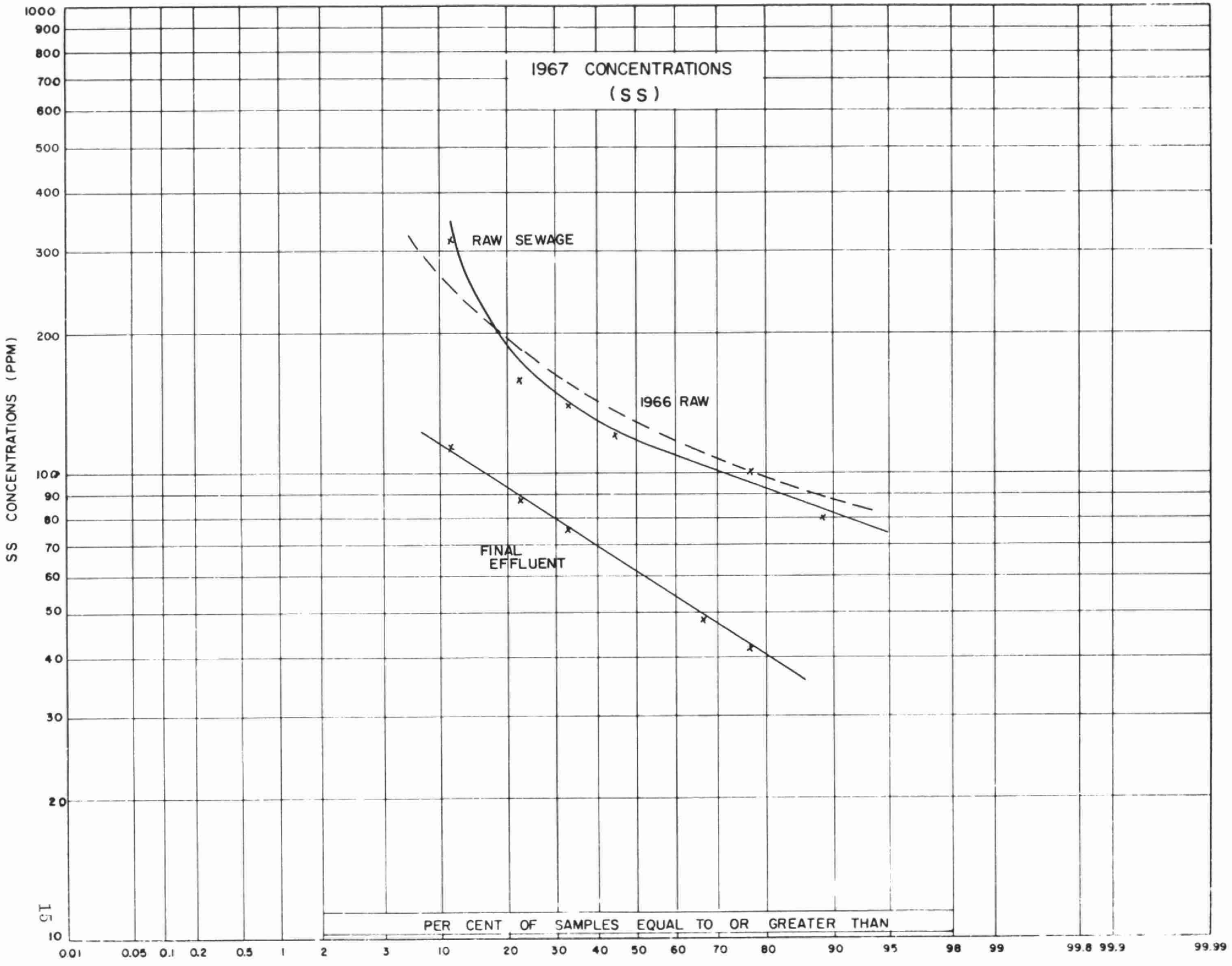
A peak flow rate of 20.87 mgd occurred during the week ending March 31.

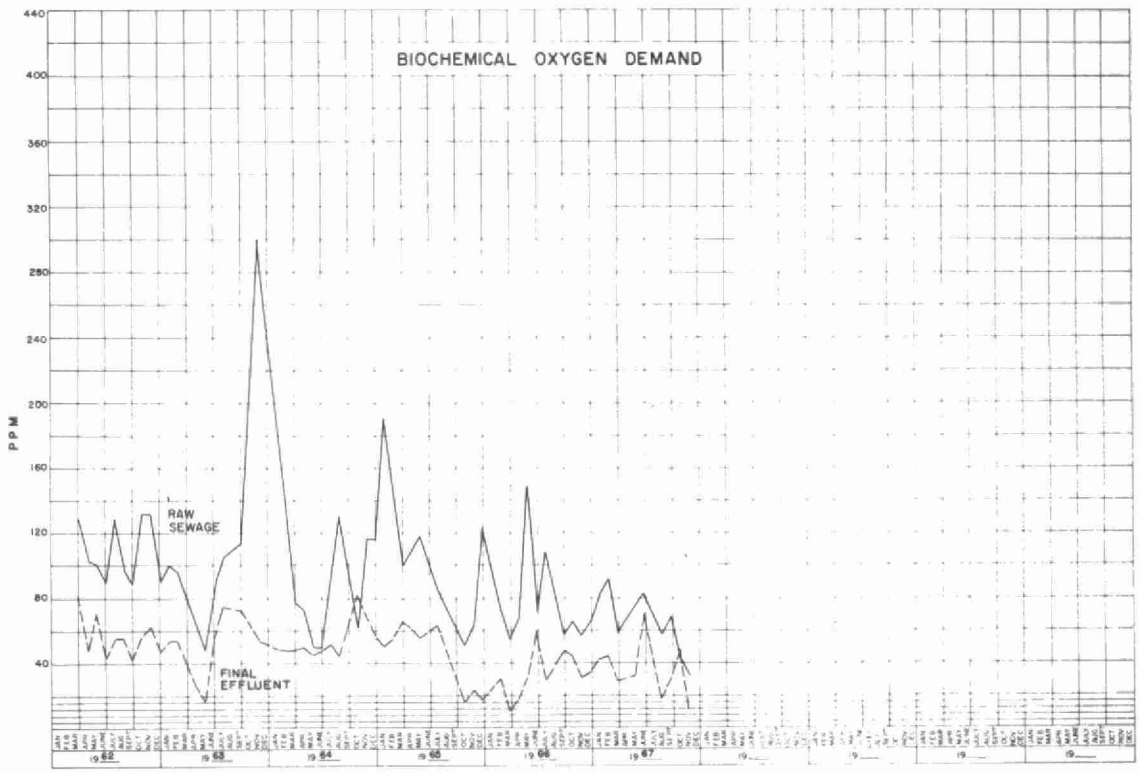

PROBABILITY OF DAILY FLOW
MGD
DESIGN CAPACITY
1967
1965
1966
1964
1963
% EQUAL TO OR GREATER THAN
100
90
80
70
60
50
40
30
20
10
9
8
7
6
5
4
3
2
1
0.01
0.05
0.1
0.2
0.5
1
2
3
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9


AVERAGE DAILY FLOW PER MONTH
MGD
14·0
13·0
12·0
11·0
10·0
9·0
8·0
7·0
6·0
5·0
4·0
3·0
DESIGN CAPACITY
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC
19 62
19 63
19 64
19 65
19 66
19 67
19 ___

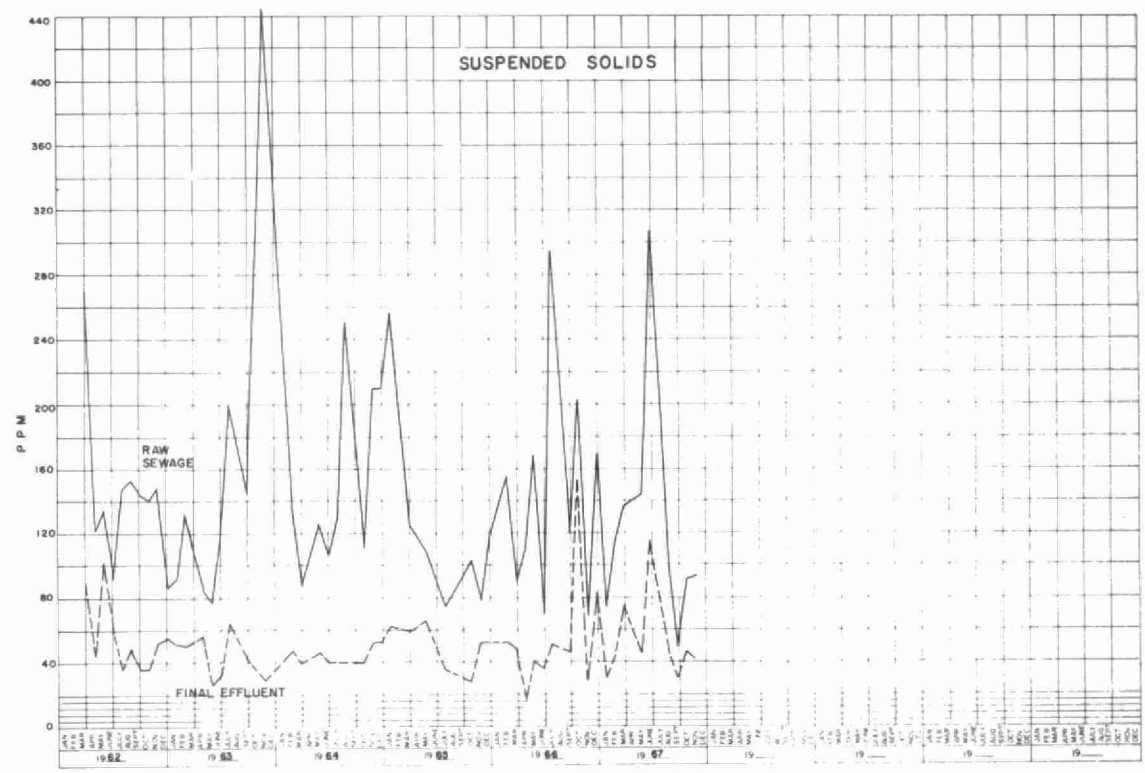

TOTAL MONTHLY FLOWS
MILLION GALLONS
440
400
360
320
280
240
200
160
120
80
40
0
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT. NOV DEC
19 62
19 63
19 64
19 65
19 66
19 67
19 ____


1967 CONCENTRATIONS
(BOD)
BOD CONCENTRATIONS (PPM)
1000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
10
1966 RAW
RAW SEWAGE
FINAL
EFFLUENT
PER CENT OF SAMPLES EQUAL TO OR GREATER THAN
0.01
0.05
0.1
0.2
0.5
1
2
3
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99


1967 CONCENTRATIONS
(SS)
RAW SEWAGE
1966 RAW
FINAL
EFFLUENT
SS CONCENTRATIONS (PPM)
1000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
PER CENT OF SAMPLES EQUAL TO OR GREATER THAN
0.01
0.05
0.1
0.2
0.5
1
2
3
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99



MONTHLY VARIATIONS



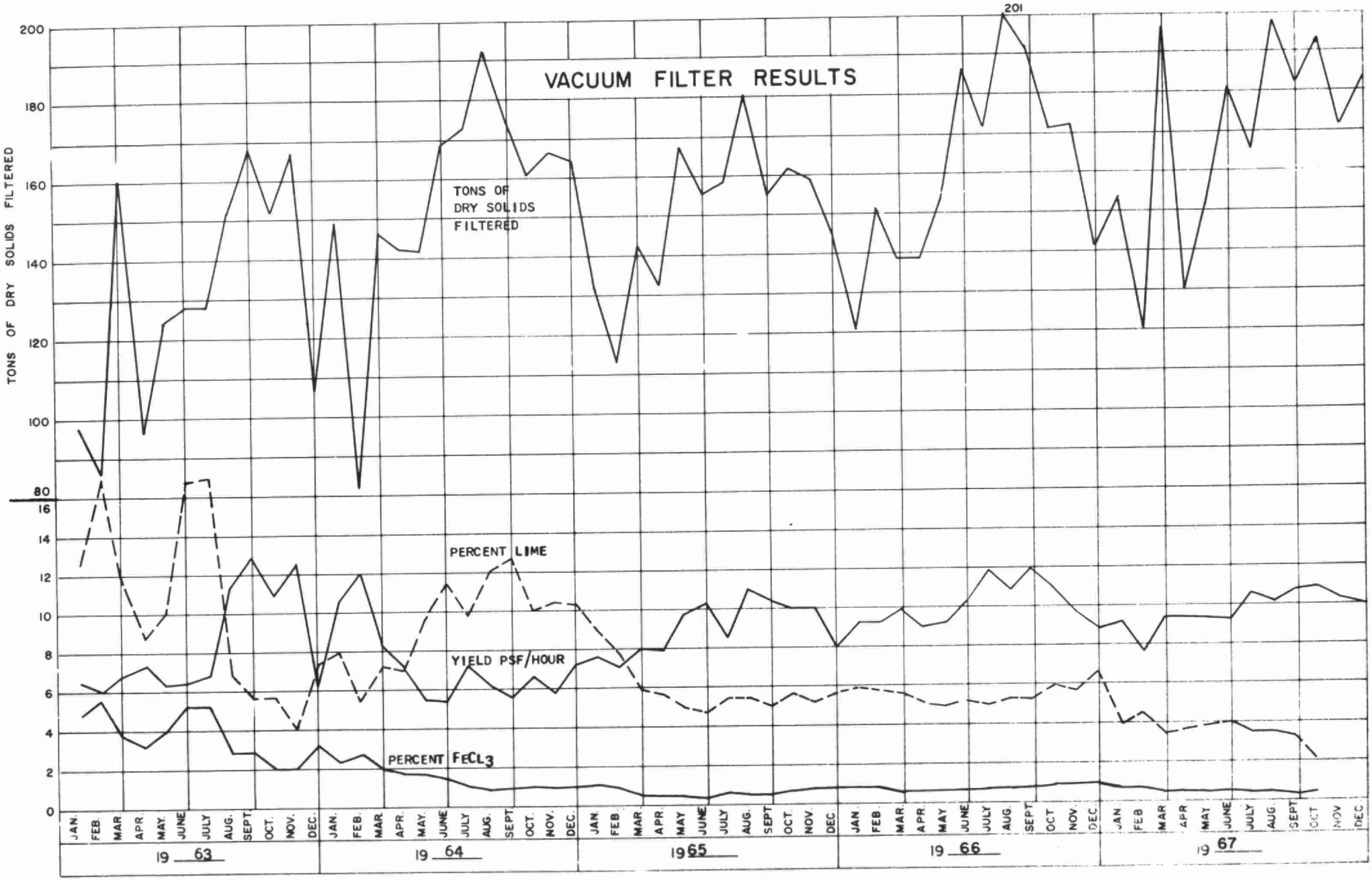
GRIT, B.O.D AND S.S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	82	42	48.8	41.2	74	30	59.4	45.4	598
FEB.	92	44	52.2	42.0	114	61	46.5	46.4	279
MAR.	58	29	50.0	40.8	136	74	45.6	87.2	455
APR.	-	-	-	-	-	-	-	-	185
MAY	72	32	55.6	49.9	144	45	68.8	123.6	262
JUNE	81	70	13.6	11.2	306	114	62.7	195.6	255
JULY	-	-	-	-	-	-	-	-	254
AUG.	57	19	66.7	36.6	100	47	53.0	51.0	263
SEPT.	68	29	57.4	37.2	49	30	38.8	18.1	240
OCT.	43	46	-	-	91	47	48.4	49.2	316
NOV.	32	11	65.6	29.8	93	43	54.8	72.4	152
DEC.	-	-	-	-	-	-	-	-	199
TOTAL	-	-	-	405.5	-	-	-	950.8	3458
AVG.	65	36	44.6	33.8	123	55	55.3	79.2	288

COMMENTS

The percent reductions of 44.6 and 55.3 of BOD and SS respectively are slightly below the average for a primary treatment plant.

The influent BOD and SS concentrations indicate a weak sewage.


VACUUM FILTER RESULTS
TONS OF DRY SOLIDS FILTERED
TONS OF DRY SOLIDS FILTERED
PERCENT LIME
YIELD PSF/HOUR
PERCENT FeCl3
201
200
180
160
140
120
100
80
16
14
12
10
8
6
4
2
0
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC.
19 63
19 64
1965
19 66
19 67

VACUUM FILTER OPERATION

MONTH	% SOLIDS FILTRATE	FILTER HOURS	% SOLIDS SLUDGE	LBS. DRY SOLIDS FILTERED	LBS. LIME (AS CAO)	% LIME (AS CAO)	LBS. $FeCl_3$	% $FeCl_3$	% SOLIDS FILTERED SLUDGE	YIELD PSF/HOUR
JAN.		172.0	6.2	307701	12180	4.0	2023	0.7	25.7	9.2
FEB.	0.48	156.0	5.0	241882	10920	4.5	1788	0.7	24.4	7.7
MAR.	0.35	207.0	6.4	394849	14000	3.5	2125	0.5	28.6	9.3
APR.	0.32	140.0	6.0	262568	9800	3.7	1502	0.6	25.6	9.3
MAY.	0.40	166.0	6.1	304936	11760	3.9	1811	0.6	25.2	9.3
JUNE	0.48	189.0	6.4	362894	14625	4.0	2355	0.6	24.8	9.2
JULY	0.50	156.0	7.2	332378	12110	3.6	1947	0.6	26.8	10.6
AUG.	0.60	192.0	6.9	398545	14435	3.6	2199	0.6	26.3	10.2
SEPT.	0.53 0.46	133.0 37.0	7.1 6.9	291271 75224	10150 *	3.5 -	1412 *	0.5 -	24.4 26.2	11.1 10.4
OCT.	0.52 0.49	153.5 18.0	6.5 7.5	348302 39156	* 840	- 2.1	* 216	- 0.6	25.5 24.8	10.7 11.1
NOV.	0.52	164.0	6.6	343942	*	-	*	-	26.2	10.4
DEC.	0.45	184.0	6.7	366793	*	-	*	-	24.2	10.1
TOTAL	-	2067.5	-	4070491	+110820	-	+ 17378	-	-	-
AVG.	0.46	172.3	6.5	339207	12313	3.8	1931	0.6	25.7	9.8

* POLYELECTROLYTES USED IN LIEU OF CAO AND $FeCl_3$
+ REPRESENTS APPROXIMATELY 9 MONTHS USE OF CAO AND $FeCl_3$

COMMENTS

The table above gives relevant data for the filtration of raw sludge.

The percent concentration of filtered sludge of 25.7 is considered good for the type of equipment in service.

The percentages of ferric chloride and lime used during the first 10 months of 1967 are very low.

During November and December polyelectrolytes were used in lieu of ferric chloride and lime. The use of polyelectrolytes substantially reduced the amount of chemical handling and equipment involved in filtration as well as greatly reducing chemical costs.

The good yield, low number of hours of operation and small quantities of chemicals used is due to good operation and the nature of the raw sludge.

VACUUM FILTER COSTS (MONTHLY)

MONTH	COST PER MONTH					TOTAL	COST PER TON DRY WEIGHT					TOTAL
	$FeCl_3$	CaO	LABOUR	ELEC	MAINT		$FeCl_3$	CaO	LABOUR	ELEC	MAINT	
JANUARY	168.52	177.46	277.29	153.85	178.32	955.44	1.10	1.15	1.80	1.00	1.16	6.21
FEBRUARY	148.94	159.10	253.90	120.94	163.28	846.16	1.23	1.32	2.10	1.00	1.35	7.00
MARCH	177.01	203.98	334.08	197.42	214.84	1127.33	0.90	1.03	1.69	1.00	1.09	5.71
APRIL	125.12	142.79	227.18	131.28	146.09	772.46	0.95	1.09	1.73	1.00	1.11	5.88
MAY	150.86	171.34	267.26	152.49	171.88	913.83	0.99	1.12	1.75	1.00	1.13	5.99
JUNE	196.17	213.07	304.01	181.45	195.51	1090.21	1.08	1.17	1.68	1.00	1.08	6.01
JULY	162.19	176.44	253.90	166.19	163.28	922.00	0.98	1.06	1.53	1.00	0.98	5.55
AUGUST	183.18	210.33	310.69	199.27	199.81	1103.28	0.92	1.06	1.56	1.00	1.00	5.54
SEPTEMBER	117.62	147.89	273.95	183.25	176.17	907.03	0.81	1.02	1.50	1.00	0.96	5.51
OCTOBER	17.99	12.24	277.29	193.73	178.32	700.46	0.92	0.63	1.43	1.00	0.92	5.02
NOVEMBER	*	*	263.92	171.97	169.73	619.80	*	*	1.53	1.00	0.99	3.60
DECEMBER	*	*	297.33	183.40	191.21	693.00	*	*	1.62	1.00	1.04	3.77
TOTAL	1447.60	1614.64	3340.80	2035.24	2148.44	10651.00						
AVERAGE PER MONTH	160.84	179.40	278.40	169.60	179.04	887.58	0.98	1.06	1.66	1.00	1.07	5.48

* VARIOUS POLYMERS WERE USED IN LIEU OF CaO AND $FeCl_3$ FROM SEPTEMBER THROUGH DECEMBER. POLYMER COSTS AS LISTED BELOW ARE INCLUDED IN THE "TOTAL" COLUMNS OF THE TABLE.

MONTH	COST PER MONTH	COST PER TON DRY WEIGHT
SEPTEMBER	$ 8.15	$0.22
OCTOBER	20.89	0.12
NOVEMBER	14.18	0.08
DECEMBER	21.06	0.11

COMMENTS

The low unit costs per dry ton are considered excellent.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (P.P.M)
JANUARY	206.18	-	-
FEBRUARY	174.92	-	-
MARCH	281.27	-	-
APRIL	324.26	-	-
MAY	249.70	* 5110	2.05
JUNE	203.75	9015	4.42
JULY	197.87	10070	5.09
AUGUST	192.35	10730	5.58
SEPTEMBER	190.95	11300	5.92
OCTOBER	223.88	12255	5.47
NOVEMBER	283.81	** 7795	4.12
DECEMBER	267.63	-	-
TOTAL	2796.57	66275	-
AVERAGE	233.05	11046	4.66

* Chlorination for 16 days
** Chlorination for 20 days

COMMENTS

The plant effluent was chlorinated from May 11 to November 16.

During 1966 chlorination was required at a rate of 4.66 ppm to maintain a residual of 0.5 ppm after 15 minutes contact time. This is low for this type of plant and is due to the relatively low BOD of the effluent.

CONCLUSIONS

Although the strength of the raw sewage is relatively weak, the plant is hydraulically overloaded 40% of the time usually in the spring and late fall. Peak flows have approached a rate of 21 mgd for short periods.

The expansion of the Clark Creek pumping station should effectively eliminate most pumping problems but will cause even more overloading at the plant. An excessive amount of grease continues to cause operation difficulties.

RECOMMENDATIONS

A more stringent by-law control of industrial wastes should be implemented.

Storm water flows should be eliminated from the sewer system to reduce the hydraulic loading on the plant.


ONTARIO WATER RESOURCES COMMISSION